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Bos, A.P.; ferwerda, R.

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Aristotle's *De spiritu* as a Critique of the Doctrine of *pneuma* in Plato and His Predecessors

A.P. Bos[a] **and R. Ferwerda**[b]
[a] *Vrije Universiteit, Faculteit der Wijsbegeerte,*
De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands
a.p.bos@ph.vu.nl
[b] *Stationsweg 79, 6711 PL Ede, The Netherlands*
rferwerda@wanadoo.nl

Abstract
The treatise *De spiritu* of the Corpus Aristotelicum deserves better treatment than it has received since W. Jaeger in his 1913 article rejected its authenticity and dated it one hundred years after Aristotle. In this paper the authors argue that *De spiritu* defends purely Aristotelian viewpoints against persons like Plato and Empedocles, who held respiration to be the most important vital process. Most of the *De spiritu* is directed against the *pneuma* doctrine of Plato's *Timaeus*. The 'Aristogenes' mentioned in *De spiritu* 2 is either Plato 'the son of Ariston' or a contemporary pupil of Plato and Aristotle.

Keywords
Aristotle, *De spiritu*, Plato, *Timaeus*, ancient psychology, pneumatology

1. Introduction

The Aristotelian Corpus includes a work entitled *Peri pneumatos*, usually cited by its Latin title *De spiritu*. References to this text are rare in the modern era. Aristotle's authorship has been almost generally denied since the fifteenth century.[1] The only exception to prove the rule was P. Gohlke.[2]

[1] Cf. Tricot 1951, v and ix; Roselli 1992, 17.
[2] Gohlke 1949, 88; 1953, 18 and 196. Gohlke is, however, prepared to see the work as

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The Greek text of the work, fourteen pages in all, leaves much to be desired. But the subject announced in the opening sentence may arouse the reader's curiosity. We read there: 'How is it that the innate *pneuma* maintains itself and grows?'[3)]

The 'innate *pneuma*'[4)] is a central subject in Aristotle's biological works. For living creatures this substance is often presented as being crucial to their quality of life, of perception, of mental activity, and of physiological vigour. According to a famous text in *De generatione animalium* 2.3, 736b30-737a1, *pneuma* is already present in semen and is an analogue of the astral element, which is responsible for the fertility and life-generating power of semen. It seems natural to assume that there is more *pneuma* in a fully grown living creature than in the semen from which the creature was formed (or in the menstrual fluid fertilized by it). The obvious question then is: what maintains *pneuma* and how does the volume of *pneuma* increase?

A generally acknowledged work by Aristotle also seems to have underlined the interest of this theme. *De motu animalium*, in a section which emphasizes the importance of *pneuma* in living creatures, contains the following remark: 'How this innate *pneuma* is maintained has been set out elsewhere.'[5)] The question is whether this refers to any particular part of the Corpus.

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uncompleted, a sketch, from Aristotle's final phase (21). Gohlke also demonstrated his independence in his defence of the authenticity of *De mundo*.

3) *Spir.* 1, 481a1: Τίς ἡ τοῦ ἐμφύτου πνεύματος διαμονὴ καὶ τίς ἡ αὔξησις; but see also *Iuv.* 6, 470a22 ff.; *Resp.* 5, 472b7. For *Spir.* see V.G. Jaeger 1913; Dobson [1914] 1931; Hett 1936; Gohlke [1947] 1953; Tricot 1951; Barnes 1984 (as regards *Spir.* this edition is almost identical to Dobson's 1914 edition); Roselli 1992, with a revised Greek text based on a collation of more manuscripts and with a critical apparatus, translation and commentary.

4) 'Innate' should not be mistaken to mean 'present from birth'. *Spir.* 5, 483a13 notes that though respiration starts at birth, nutrition and growth occur before birth, owing to *pneuma* or vital heat. *Pneuma* is best left untranslated. If we must choose an English equivalent, 'vital spirit' is better than 'vital breath', because the latter term suggests a connection with respiration.

5) *MA* 10, 703a10: τίς μὲν οὖν ἡ σωτηρία τοῦ συμφύτου πνεύματος, εἴρηται ἐν ἄλλοις. Zeller (1921, II.2 96 n. and 937-8) had denied *De motu animalium* to Aristotle on account of this 'reference to *De spiritu*'. The passage is usually regarded as an aside and put between round brackets. In W. Jaeger's view the reference forms an interruption and seems to duplicate 703a16: πότερον μὲν οὖν ταὐτόν ἐστι τὸ πνεῦμα ἀεὶ ἢ γίνεται ἀεὶ ἕτερον,

Another intriguing feature of the *De spiritu* text is that it seems to say that *pneuma* 'forms a natural unity with the soul'.[6] But the author also says that it 'is the vehicle of the soul in a primary sense'.[7] These are remarkable statements which compel us to ask: how does the position of *De spiritu* relate to Aristotle's generally recognized doctrine of soul? In passing the author also suggests that the innate *pneuma* is 'the primary moving cause'.[8] His argument against the position that *pneuma* increases through the process of respiration is completely in line with Aristotle's method. He contends that there are also living creatures which do not breathe (but which do possess *pneuma*).[9] Also, *Spir*. 5, 483b2 seems to refer to the *Anatomies*, a source which Aristotle often cites in his biological works.[10] Such references are found only in Aristotle's work.[11] But in *Spir*. 3, 482b8 the author also says: 'Therefore we must, as we said, look at respiration, the purpose for which (it takes place) and for which parts and how.' The words 'as we said' may well refer back to *De respiratione* 3, 471b26-9.

ἔστω ἄλλος λόγος ([1913] 1960, 76). Cf. Forster 1937, 472; Nussbaum 1978, 51 and 375-7. In *Somn. Vig.* 2, 456a8 Aristotle remarked: τὸ ἀναπνεῖν τε καὶ τῷ ὑγρῷ καταψύχεσθαι πρός γε τὴν σωτηρίαν τοῦ ἐν τούτῳ μορίῳ θερμοῦ ἡ φύσις πεπόρικεν· ῥηθήσεται δὲ περὶ αὐτῆς ὕστερον καθ' αὑτήν. Ross connects this with *Juv.* 14 and 19. Cf. also *Resp.* 6, 470a20: τοῖς μὲν φυτοῖς ἡ διὰ τροφῆς καὶ τοῦ περιέχοντος ἱκανὴ γίνεται βοήθεια πρὸς τὴν τοῦ φυσικοῦ θερμοῦ σωτηρίαν.

[6] *Spir.* 1, 481a16: καθαρώτερον γὰρ ὃ τῇ ψυχῇ συμφυές. Cf. also 9, 485b13: διόπερ οὐ κακῶς εἰς ταὐτόν, referring to the unity of the soul and *pneuma* as its instrument.

[7] *Spir.* 5, 483b10: τὸ πρῶτον δεκτικὸν ψυχῆς. Cf. also 3, 482b23.

[8] *Spir.* 2, 481b17: τὸ πρῶτον κινοῦν. Cf. 8, 485a7: τὸ πνεῦμα τὸ κινητικόν.

[9] *Spir.* 2, 482a8; 482a22.

[10] Cf. Ross 1955, 264: "References in A. to ἀνατομαί are frequent. Sometimes the reference is to actual dissections (*De Juv.* 474b9; 478a27; *De Part.* 677a9; *De Gen. An.* 746a22, 764a35, 771b32, 779a8); in other cases the reference is to the record of dissections in a work now lost (e.g.… *Hist. Anim.* 497a32; cf. ibid. 525a9, 566a15, *De Gen. An.* 746a15)." See also n. 11 below.

[11] Curiously, this passage represents the position of others, so that it seems in *Spir.* that Aristotle's opponents are citing material from the *Anatomies.* For W. Jaeger ([1913] 1960, 62) it is unthinkable that a later pupil of Aristotle would refer to the *Metaphysics*, as in *MA* 1, 698a7, but he makes light of the idea that such a 'handbook' would have been cited by a later author. Cf. Nussbaum 1978, 10. Note, however, that 5, 483b22-23 says that the *artêria* contains moisture. This seems to imply that a corpse has been observed. If it is then said that 'ἐκ τῶν ἀνατομῶν is clear', we could specifically relate this to the dissection of corpses.

2. What Was Known about *De spiritu* in Antiquity?

The title of a work 'On *pneuma*' is absent in the Greek lists of Aristotle's writings, but is mentioned in the Arabic one.[12] Some modern authors believe that Galen and Pliny may have referred to *De spiritu*.[13]

3. What Has Been Said about *De spiritu* in the Modern Era?

In his well-known 1913 article W. Jaeger also discusses *De spiritu*.[14] But first he outlines Aristotle's doctrine of *pneuma*, which he believes to be the earliest identifiable representative of the doctrine of an innate *pneuma* (p. 71): "Alle Lebewesen besitzen angeborenes Pneuma, in ihm wurzelt ihre Lebenskraft" (p. 74). This also applies to *De motu animalium*. Briefly summarizing the contents of *De spiritu*, he stresses how incoherent its composition is. The opening question of *De spiritu*—what is responsible for the continuity of the innate *pneuma* and for its increase?—is dealt with rather tentatively in the first two chapters (p. 86). The author then goes on to discuss various issues regarding respiration and the functions of blood. Everything Jaeger considers dissatisfactory here is seen to result from an abridgement of a more extensive discussion. This abridgement was carried out by a person with little talent and expertise (p. 89). Jaeger is nevertheless

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[12] W. Jaeger ([1913] 1960, 77) observes that *De motu animalium* occurs in Hesychius (no. 156) and Ptolemy (no. 41), but *Spir.* does not. However, as A. Roselli (1992, 13 n. 1) indicated, a *De spiritu* in three books is mentioned in the Arabic catalogue ascribed to Ptolemy el-Garib, no. 24 in the numbering according to the new Arabic manuscript found in Istanbul and presented in Hein 1985, 388-439. Moraux (1951, 294) notes of *Spir.*: "L'ouvrage (en un seul livre) est bien issu de l'école péripatéticienne, mais il est sûrement postaristotélicien. L'auteur fait montre de connaissances d'ordre anatomique et médical qui permettent de le situer vers le milieu du 3^{e} siècle avant J.-C." See also p. 300.

[13] Cf. Gal. *De simpl. med. temp. et fac.* 5.9 (vol. 11, 730.16 ff. Kühn): ἀλλ' ἡμᾶς χρὴ… γιγνώσκειν ἔμφυτον εἰρῆσθαι θερμόν, ὅπερ καὶ πνεῦμα ἑκάστῳ τῶν ζῴων ὀνομάζομεν, ὑπὲρ οὗ καὶ Ἀριστοτέλης ἔγραψεν, and Plin. *Nat.* 11.220, which looks like a quotation of *Spir.* 6, 484a35. Cf. Roselli 1992, 13.

[14] W. Jaeger [1913] 1960, esp. 86-100. At the same time Jaeger published a text edition of *De motu animalium, De progressu animalium*, and *De spiritu* in the Bibliotheca Teubneriana. The article provides the reasons why Jaeger considers the authenticity of *De motu animalium*, which had been denied since Rose 1854, 163, to be absolutely unassailable, but also why *De spiritu* is clearly non-Aristotelian.

prepared to assume some coherence for chapters 1 through 8. In his view, however, chapter 9 is a later addition by a Stoic with an interest in the Peripatetic theory of the innate *pneuma*.[15)]

In arguing against the work's authenticity, Jaeger follows V. Rose, whom he greatly admires.[16)] In his accepted writings Aristotle shows knowledge of two kinds of blood, but only of one kind of blood vessel (*phlebes*). And the Greek word *artêria* means 'windpipe' in Aristotle. According to Jaeger, however, *De spiritu* distinguishes 'veins' (*phlebes*) and *artêriai* to designate the system of veins and arteries.[17)] Jaeger believes that it depends here on the anatomist Praxagoras of Cos, who developed this notion at the same time as Aristotle or slightly later (p. 89). But this dependence must have been mediated by Praxagoras' pupil Erasistratus, who (in contrast to Praxagoras) was also a Peripatetic.[18)]

J.F. Dobson (1914)

The Works of Aristotle Translated into English, vol. 3 (Oxford 1931) includes the translation of *De spiritu* which J.F. Dobson published in 1914. In the Preface the author notes: "This treatise has been rejected as spurious by practically all editors, one of the chief reasons being the confusion of the senses assigned to *artêria*. It is sometimes ascribed to Theophrastus. Its author had certainly studied the Aristotelian Corpus, and analogies may be traced to the *de Respiratione* and some of the zoological treatises."

The translation used W. Jaeger's 1913 edition of the Greek text. Despite its countless defects, it was included without any changes in Barnes 1984.

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15) W. Jaeger [1913] 1960, 98-100. Jaeger's chief objection to chapter 9 is that it assigns such an important role to fire. But the author of *Spir.* 9, 485b9 says quite explicitly that the generation of living entities is not a matter of fire or *pneuma* (in itself), but of the soul which uses fire as its instrument. The theory of *De anima* 2.4, 416a9-18 is not fundamentally different. The fact that the Stoa also talked about a τεχνικὸν πῦρ is entirely irrelevant as an argument against the work's authenticity.

16) Rose 1854, 163 ff.

17) W. Jaeger [1913] 1960, 89. Tricot (1951, v) regards this argument as unsound: "l'auteur, quel qu'il soit, entend par artères, non pas les vaisseaux sanguins, mais des ramifications respiratoires, ce qui enlève toute portée à cette prétendue distinction". Cf. also 176 n. 4; 181 n. 2.

18) W. Jaeger [1913] 1960, 90. Cf. Harris 1973, 97 ff. For Harris's assessment of *Spir.*, see also pp. 164 and 175-6 n. 1.

W.S. Hett (1936)

W.S. Hett (1936, 484-5) calls *Spir.* "obviously un-Aristotelian". He observes "a general lack of coherence in the thought". The work's central notions, *pneuma* and *artêria*, are left clouded in obscurity.

Also, the Greek text (which Hett adds in his edition) is uncertain in many places, often making a satisfactory interpretation impossible.

P. Gohlke (1947)

P. Gohlke, always a stalwart defender of the texts attributed to Aristotle, must concede in the Introduction to his translation (1947, 18-21) "dass man wirklich an ihrer Echtheit zweifeln könnte" (18). The work is clearly incomplete and little more than a compendium of notes. Yet Gohlke maintains "dass Aristoteles selber die Schrift in ihrem jetzigen Zustande hinterlassen hat" (18). The work's theme, the "Lebensluft", disappears from view in the last section (19). But the theme does belong to the philosopher's last phase (20). Gohlke sees the work's statements on *artêriai* as a new insight into the difference between arteries and veins as we recognize it today (20).

The author proposes corrections to the Greek text in twelve places. His own translation of the Greek text calls for even more corrections.

J. Tricot (1951)

This translation of the *Parva naturalia* and *De spiritu* was the first to publish *De spiritu* in French. Tricot assigns the work to the oeuvre of the physician Erasistratus of Ceos and dates it to c. 250 BCE (p. v). Importantly, Tricot notes that the use of the term *artêria* in the work does not indicate the author's familiarity with the distinction between the venous and the arterial systems, as Jaeger and others had claimed. In *De spiritu*, says Tricot, *artêriai* are not blood vessels, but branches of the windpipe. *De spiritu* has no knowledge of the distinction between veins and arteries in the vascular system (pp. v; 176, n. 4).

Tricot did not use the translations by W.S. Hett (1936) and P. Gohlke (1947).

M.C. Nussbaum (1978)

In her valuable edition with commentary of *De motu animalium*[19] M.C. Nussbaum also makes some remarks on *De spiritu*. She notes that "[V.] Rose denied that the *MA* could be connected with the obviously inferior *De Spiritu* . . .". "And in general we have every reason to dissociate this careful and interesting treatise [*MA*] from the messy later work." (p. 7) In her commentary on *MA* 10, 703a10-1 she notes: "The *De Spiritu* is a confused and inferior late work that does not even profess to be by Aristotle and acknowledges its late date by references to the theories of Aristogenes of Knidos, who wrote around the middle of the third century B.C." (p. 375)

The Revised Oxford Translation *(Barnes 1984)*

This new edition of the *Complete Works of Aristotle* assigns two asterisks to *De spiritu*, explaining: "a pair of asterisks indicates that its spuriousness has never been seriously contested" (p. xiii). The translation by J.F. Dobson has been integrally adopted, including mistakes as in 2, 482a9, 482b6-7; 3, 482b6; 5, 483b31, 484a7 and the gross error in 8, 485a22. However, the footnotes omit some of Dobson's comments.

A. Roselli (1992)

A. Roselli published a new edition of the Greek text with translation and commentary of *De spiritu* in 1992. She follows W. Jaeger in concluding that it is a rather early Peripatetic text, but believes that it uses insights developed by the well-known Hellenistic scholar Erasistratus, though his name is not mentioned.[20] The physician 'Aristogenes', who is mentioned and discussed in *De spiritu*,[21] is said to have been writing around the middle of the third century BCE.[22]

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[19] Nussbaum 1978.

[20] Roselli 1992, 18 and 10.

[21] *Spir.* 2, 481a28 ff.

[22] Cf. W. Jaeger [1913] 1960, 91 and 101; Roselli 1992, 76-8. A man by this name who came from Cnidos was supposedly a pupil of the physician Chrysippus, who was also Erasistratus' teacher.

According to Roselli, *De spiritu* owes its name to the work's first two chapters. But the author fails to develop his own position in these. The next two chapters deal with subjects that do have a certain connection with the theme of *pneuma*. Chapters 5 and 6 are the least comprehensible. They reproduce abstracts of texts by others. They are followed by chapters about the bones of living creatures (chapter 7) and about locomotion (chapter 8). The final chapter talks about the role of vital heat in all that lives. According to Roselli, then, the entire work is fragmentary and fails to tell us anything about the author's own views (p. 5). For this reason she has given up on the idea of finding a coherent series of positions in the work (p. 6). Roselli finds it more useful to compare the treatise with the medical text of the *Anonymus Londinensis* and with the Hippocratic Corpus and the work of later medical authors like Galen.

Roselli notes an ambivalent use of the term *artêria* in the work, sometimes linking up with the older anatomical tradition, sometimes following the newer (p. 10). Likewise the term *neuron* sometimes occurs in the early sense of 'sinew' and sometimes in the newer, Alexandrian sense of 'nerve' (p. 11).

Remarkably, Roselli rejects the view of E. Neustadt and W. Jaeger (1913) that the final chapter is much later than the rest and moves outside the Peripatetic tradition (p. 12). According to Roselli, the work is important because it allows us to reconstruct some of the discussions following from the anatomical discoveries by Alexandrian physicians (p. 12).

Roselli did not use P. Gohlke's German translation (1947).

4. Critical Evaluation of the Modern Debate

It is astonishing how confidently W. Jaeger spoke in his 1913 article and how since then every student of *De spiritu* has followed in his footsteps, while on the other hand many other scholars have neglected the work, because they accept Jaeger's authority without question. Jaeger is convinced that Aristotle is not the author of *De spiritu*. Virtually the only arguments he adduces are those which support this position. But we should look at the other side of the picture as well: if the work is later than Aristotle's time, which facets of the work can be seen to sit uncomfortably with this date?

Thus the work mentions an 'Aristogenes' who defended a theory of *pneuma* that is rejected by the author of *De spiritu*. 'Aristogenes" position seems to have been that respiration increases the volume of the innate *pneuma* during the growth of an individual. Each of the arguments marshalled against this view in *De spiritu* can be found in Aristotle's recognized work. Another view attributed to the opponents is that fish have a respiratory system.[23] As in Aristotle's generally recognized works, the author of *De spiritu* argues that water does not contain air.

The question urges itself: isn't the theory attributed to 'Aristogenes' rather naïve and simplistic and could it have been defended a hundred years after Aristotle's death? First of all we need to examine whether the theory which Aristotle disputes in *De respiratione* 6 is the same as that of 'Aristogenes' in *De spiritu* 2. *De respiratione* 6 dismisses a theory which holds that respiration serves to 'feed' the 'internal fire' of a living creature, in the sense that the inhaled air provides fuel for the vital heat. Jaeger was convinced that the 'Aristogenes' of *De spiritu* came from Cnidos and lived in the time of Erasistratus and King Antigonus Gonatas, whose physician he was.[24] But there is no indication of this in the work itself. There was probably more than one Aristogenes.[25] And it is doubtful whether an Aristogenes who lived a hundred years after Aristotle could have awarded the special kind of mediatory role to *pneuma* as 'Seelenorgan'[26] which *pneuma* possesses in *De spiritu*.

Modern authors who date *De spiritu* after Aristotle's death should also explain why this text, like the *Parva naturalia*, mainly conducts a debate on theories like those of Empedocles (who is mentioned three times) and

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[23] *Spir.* 5, 483b34. It would be interesting to point out examples of such a position from the time around 250 BCE.

[24] W. Jaeger [1913] 1960, 91.

[25] Wellmann (1895) mentions four more people with the same name. And, of course, the claim that the work cannot be Aristotelian because the name of Aristogenes occurs in it is just as strong as the claim that the Aristogenes in question must have lived before 322 because he is mentioned in a work by Aristotle.

[26] Cf. W. Jaeger [1913] 1960, 83-4: after Aristotle "bricht die kunstvolle Synthese des Aristoteles notwendig einmal wieder auseinander".

Democritus, whereas (apart from the name 'Aristogenes') it fails to mention (contemporaries of) Praxagoras or Erasistratus.[27)]

No doubt Rose and Jaeger are right when they point to a difference in terminology between most of Aristotle's biological works and *De spiritu*, particularly in regard to the term *artêria*. In the work this term sometimes seems to denote an air passage and sometimes a blood vessel. But it is unclear what consequences should be attached to this. We know that the distinction between two parts of the vascular system was familiar to Aristotle in *De generatione animalium*.[28)] But there is no indication that he connected this with a distinction between oxygen-rich and oxygen-poor blood.

Jaeger also regards Erasistratus as the source of *De spiritu*, because he believes that the soul no longer plays a role in it: nature has taken its place and a blind mechanism of *pneuma*-matter seems to be posited.[29)] We should note, though, that the author of this work, though focusing on *pneuma*, most certainly knows that *pneuma* is only so important because it is the primary vehicle and instrument of the soul![30)]

5. Vital Heat as the Multifunctional Instrument of the Soul in Chapter 9

In view of the foregoing, it may be useful to look in somewhat more detail at chapter 9, which concludes *De spiritu*. The author enters into a debate there with those who refuse to attribute any productive activity to 'fire', but are willing only to award it one power: the power to cut.[31)] A striking

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[27)] Roselli (1992, 76) notes: "la menzione di Aristogene fornisce l'unico elemento esplicito per la datazione di *Spir.*".

[28)] Cf. *GA* 2.4, 738a11: σχιζομένων ἄνωθεν τῶν δύο φλεβῶν, τῆς μεγάλης καὶ τῆς ἀορτῆς, πολλαὶ καὶ λεπταὶ φλέβες τελευτῶσιν εἰς τὰς ὑστέρας. Peck (1942, 180 n. a) comments here: "the *vena cava* and the whole venous system, and the aorta and the whole arterial system". See also 740a28.

[29)] W. Jaeger [1913] 1960, 96.

[30)] Cf. *Spir.* 1, 481a17 and all of chapter 9.

[31)] *Spir.* 9, 485a28: Οἱ ἀναιροῦντες ὡς οὐ τὸ θερμὸν τὸ ἐργαζόμενον ἐν τοῖς σώμασιν, ἢ ὅτι μία τις φορὰ καὶ δύναμις ἡ τμητικὴ τοῦ πυρός, οὐ καλῶς λέγουσιν. Roselli (1992, 123) notes that Arist. *Cael.* 3.5, 304a12 and 8, 307a26 urges this criticism against Plato's *Ti.* 56a.

point here is that the author uses the term 'to bring about', 'to produce'. This term also featured in Aristotle's criticism of Plato's theory of Ideas in *Metaphysics* A 9, where Aristotle blamed Plato for distinguishing only between the Ideas and that which received the Ideas. According to Aristotle, a 'productive factor' was lacking in Plato's system.[32] The term had also featured in *De anima* 2.4, where Aristotle states that fire by itself cannot be the 'productive principle', but 'fire-under-the-soul's-direction' can.[33]

The author of *De spiritu* disputes the views he rejects by pointing out that heat has very different effects on different substances: it can condense and rarefy, dissolve and harden substances.[34] Aristotle had mentioned the same variation in effects of *pneuma* in *De motu animalium* 8.[35] In *De generatione animalium* 2.1 he had also presented these qualities as being caused by vital heat and its decrease.[36] But he was quick to add that the 'exact proportion', the *logos*, of these qualities was not a result of heat but of the governing principle![37]

As regards production in living creatures, we should assume the same state of affairs, and try as it were to discern the 'fire of nature', like the fire of craft (in the cases mentioned earlier).[38] Looking at the various crafts, we can observe the different effects of fire, which melts gold and casts bronze and dries brick and prepares food. Or, rather perhaps, the crafts have these different effects. But they have these effects while using fire for

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[32] *Metaph.* A 9, 991a22: τί γὰρ ἐστι τὸ ἐργαζόμενον πρὸς τὰς ἰδέας ἀπόβλεπον; Aristotle repeatedly criticizes his teacher for the lack of a 'third principle'; cf. *Metaph.* A 9, 991b3-5; *GC* 2.9, 335a30, 335b8. Ambrose, *Hexaëmeron* 1.1, 1 had therefore attributed to Aristotle not only the principles of *species* and *materia*, but also a third principle, which he called *operatorium*.

[33] *de An.* 2.4, 416a9-18. Cf. also *Juv.* 4, 469b6-13.

[34] *Spir.* 9, 485a32: τὰ μὲν πυκνοῖ, τὰ δὲ μανοῖ, καὶ τήκει, τὰ δὲ πήγνυσιν.

[35] *MA* 8, 702a9-10: μεταβάλλοντα ἐκ πεπηγότων ὑγρὰ καὶ ἐξ ὑγρῶν πεπήγοτα καὶ μαλακὰ καὶ σκληρὰ ἐξ ἀλλήλων.

[36] *GA* 2.1, 734b31: σκληρὰ μὲν οὖν καὶ μαλακὰ καὶ γλίσχρα καὶ κραῦρα καὶ ὅσα ἄλλα τοιαῦτα πάθη ὑπάρχει τοῖς ἐμψύχοις μορίοις, θερμότης καὶ ψυχρότης ποιήσειεν ἄν. For this work, see also Ferwerda 2005. See also *PA* 2.2, 648a20-649b8.

[37] *GA* 2.1, 734b33-735a4.

[38] *Spir.* 9, 485a33: ἐν δὲ δὴ τοῖς ἐμψύχοις οὕτως ὑποληπτέον, ὥσπερ φύσεως πῦρ ζητοῦντα, καθάπερ τέχνης.

their various purposes. For they use fire as an instrument for melting, for casting, and for drying, but in some cases for purposes of design.[39)]

Just as we can say of these craftsmen that, besides their specific tools, they use fire as *sôma organikon*, so Aristotle argued in *De anima* 1.3 that the soul uses its *sôma* as an instrument.[40)] *De spiritu* makes it perfectly clear that the soul's 'instrumental body' is not the visible body, but *pneuma* (or its analogue). 'The natural vital principles (of living creatures) do the same. Hence there are all kinds of differences between them,' says the author of *De spiritu*.[41)] These vital principles play the same role in nature as the crafts in human production. That is to say, they provide the *logos* for the effect of fire.[42)]

'It may be difficult for the inquirer to see that nature itself is the user of this fire, and that nature by means of the visible qualities also brings about the form. For that is not a matter of fire or *pneuma*.'[43)] This observation, too, is entirely Aristotelian, as we can particularly infer from the passage in *De generatione animalium* 2.1 cited above.[44)] The author then continues: 'It is remarkable that these matters [i.e. 'fire' and *pneuma*] have such a faculty. And the case is just as remarkable with the soul. For it is present in them.'[45)] In any case the author of *De spiritu* is saying in plain words here that the soul is present in 'fire' and in *pneuma*. In *Spir*. 5, 483b11 he had also said

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39) *Spir.* 9, 485b1: χρῶνται γὰρ ὥσπερ ὀργάνῳ μαλάττουσαι καὶ τήκουσαι καὶ ξηραίνουσαι, ἔνια δὲ καὶ ῥυθμίζουσαι. It is interesting to compare the argument of Arist. *Pol.* 1.2, 1252b1-3, where Aristotle reasons that nature does not try to produce a kind of Swiss army-knife with dozens of functions: οὐδὲ γὰρ ἡ φύσις ποιεῖ τοιοῦτον οἷον οἱ χαλκοτύποι τὴν Δελφικὴν μάχαιραν πενιχρῶς, ἀλλ' ἓν πρὸς ἕν.

40) *de An.* 1.3, 407b25: δεῖ γὰρ τὴν μὲν τέχνην χρῆσθαι τοῖς ὀργάνοις, τὴν δὲ ψυχὴν τῷ σώματι.

41) *Spir.* 9, 485b3: Τὸ αὐτὸ δὴ τοῦτο καὶ αἱ φύσεις· ὅθεν δὴ καὶ πρὸς ἄλληλα διάφορα. (The Greek manuscripts read διαφοραί and διαφοράν.)

42) Cf. *GA* 2.1, 734b37-735a4: σκληρὸν μὲν γὰρ καὶ μαλακὸν τὸν σίδηρον ποιεῖ τὸ θερμὸν καὶ τὸ ψυχρόν, ἀλλὰ ξίφος ἡ κίνησις ἡ τῶν ὀργάνων ἔχουσα λόγον [τὸν] τῆς τέχνης· ἡ γὰρ τέχνη ἀρχὴ καὶ εἶδος τοῦ γιγνομένου, ἀλλ' ἐν ἑτέρῳ· ἡ δὲ τῆς φύσεως κίνησις ἐν αὐτῷ ἀφ' ἑτέρας οὖσα φύσεως τῆς ἐχούσης τὸ εἶδος ἐνεργείᾳ.

43) *Spir.* 9, 485b8: Οὐ δὴ τοῦτο χαλεπόν, ἀλλὰ μᾶλλον τὸ τὴν φύσιν αὐτὴν νοῆσαι τὴν χρωμένην, ἥτις ἅμα τοῖς αἰσθητοῖς πάθεσι καὶ τὸν ῥυθμὸν ἀποδώσει. τοῦτο γὰρ οὐκέτι πυρὸς οὐδὲ πνεύματος.

44) *GA* 2.1, 734b36! Cf. *de An.* 2.4, 416a13-8.

45) *Spir.* 9, 485b11: τούτοις δὴ καταμεμῖχθαι τοιαύτην δύναμιν θαυμαστόν. ἔτι δὲ τοῦτο θαυμαστὸν καὶ περὶ ψυχῆς· ἐν τούτοις γὰρ ὑπάρχει.

that *pneuma* is the primary vehicle of the soul. Thus *De spiritu* uses the same authentically Aristotelian system as *De motu animalium* 10: *pneuma* is the vehicle of the soul, the visible body is animated by the presence of *pneuma*. This is followed by a few lines of which it is very difficult to determine what the author exactly means.[46)]

The final problem tackled by the author is the question of the differences in (vital) heat in various species. Differences in fire are differences of more and less. These in turn are related to the degree in which fire is mixed with something else. The purer fire is, the more fire it is.[47)]

Again he locks horns with Empedocles, who assumed the same mixture of flesh for all species of creatures. The author of *De spiritu*, like Aristotle elsewhere in the Corpus, considers this too rough and ready. In his view, the specific *logos* of horse-flesh and of ox-flesh is determined by vital heat led by the natural principle of a horse and an ox respectively. The effect of vital heat[48)] results in different end products owing to the natural principle.

6. Brief Outline of the Contents of *De spiritu*

Chapter 1

The work starts by clearly indicating its subject: how is it that the innate *pneuma* maintains itself and grows? Two theories are mentioned in 1, 481a6-7 and then critically analyzed in chapters 1 and 2.

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46) *Spir.* 9, 485b13: διόπερ οὐ κακῶς εἰς ταὐτόν, ἢ ἁπλῶς ἢ μόριόν τι τὸ δημιουργοῦν, καὶ τὸ τὴν κίνησιν ἀεὶ τὴν ὁμοίαν ὑπάρχειν ἐνέργειαν· καὶ γὰρ ἡ φύσις, ἀφ᾽ ἧς καὶ ἡ γένεσις. Hett (1936, 515) translates here: 'Therefore the fact that its motion always exerts a similar activity may reasonably be referred to the same agent, either absolutely or to some definite effective part: for nature, from which they are generated, remains the same.' Perhaps this should be read as: 'Therefore it is not incorrect to assume a unity [of fire/*pneuma* and the soul] absolutely or the part [of the soul] that produces and that always brings about motion: for also the natural principle of life, to which generation is due, [is always present].' Furlanus and W. Jaeger suggest a correction here: ἐνεργοῦν. Perhaps ἐνεργείᾳ (Roselli) should be preferred.

47) *Spir.* 9, 485b17: πυρὸς γὰρ διαφοραὶ κατὰ τὸ μᾶλλον καὶ ἧττον. τοῦτο δὲ σχεδὸν ὥσπερ ἐν μίξει καὶ ἀμιξίᾳ· τὸ γὰρ καθαρώτερον μᾶλλον.

48) Cf. *Spir.* 9, 485b22: τῇ κράσει διαφέρειν (with Furlanus) and 485b23: τοῖς λόγοις ἂν διαφέροι.

Theory B, which is best viewed as depending on Empedocles' theory, argues that the innate *pneuma* results from the addition of food and the concoction of this food thanks to the process of respiration. Theory A sees the innate *pneuma* as being boosted by the inhaled air and concocted by the motion of the lungs. The result of this treatment of the inhaled air is to increase the innate *pneuma*. This theory is best understood as reproducing the passage in Plato's *Timaeus* on respiration and the nutrition of living creatures (see section 10 below). Both theories are based on the principle that respiration is the central phenomenon in all life processes.

Chapter 1 lodges three objections to theory B, all of which can be understood against the background of well-known Aristotelian positions.

Chapter 2

Theory A, attributed to 'Aristogenes', runs up against at least eight objections applying to living creatures with respiration. The author also considers the problems of theories A and B for insects (which do not possess a respiratory system) and for fish (in water, where respiration is impossible).

The clear structure and tight approach of chapters 1 and 2 are emphasized by a constant repetition of the problem that forms the work's starting-point. The key words 'maintenance' (or 'nutrition') and 'growth' in the opening sentence 1, 481a1 recur throughout. 1, 481a27 concludes the discussion of theory B in this way. 2, 481a28 indicates clearly that theory A will now be dealt with. 482a8 repeats the question for breathless creatures and 482a21 for aquatic animals. 482a27 clearly marks the end of chapters 1 and 2 as a whole. 2, 481b29 refers to the objections already given in 1, 481a22-7 (2, 481b1 mentions that theory A has more objections than theory B). The order of discussion of (a) animals with respiration, (b) insects, and (c) fish also plays a role in 5, 483b1 and in chapter 8 (and is also familiar from the *Parva naturalia*).

Chapter 3

Because the disputed theories see *respiration* as the central phenomenon in all vital processes, the author continues with this subject. His opponents hold that all parts of a creature's body benefit from respiration for their nutrition and refrigeration. The author adduces objections to both facets of the theory on the basis of positions familiar from parts of the *Parva*

naturalia. But in passing he also raises the point that for instance the bones of a living creature depend for their nutrition and for supply of the innate *pneuma* on the processes which are initiated by respiration (482b7). The author wants to contest this and so is forced in chapters 6-8 to deal with the topic of bone and its functions and, in turn, with sinew, and with the question what the real principle of motion of a living creature is. This will also clarify what purposes respiration serves and what parts of the body it benefits. He also casually mentions that plants possess life and are nourished. Evidently they need no system of respiration for this.

Chapter 4

In chapter 4 he discusses how (a) respiration is related to (b) the pulsatory motion and (c) the introduction of nutriment. According to the disputed theory, all three are connected with the breath in the *artêria*. He demonstrates that respiration cannot be primary, but, in the development of an individual creature, begins only after the pulsatory motion and the introduction of food. He also proves that the pulsatory motion is due to the blood in the heart, and therefore cannot be located in the *artêria*. This chapter, too, helps to provide a clearer picture of respiration than in his opponents, and to indicate that there are vital processes which are independent of respiration.

Chapter 5

The following chapter deals with the distribution of food to all parts of the body as a result of respiration. The *artêria* is given priority here. It alone contains breath/*pneuma*. The *artêria* system is a dense network that distributes the innate *pneuma*, as bearer of vital heat and the perceptive faculty, throughout the body of the living creature. The opponents hold that this dense network runs parallel to the system of blood vessels. The author makes much of their view that the bones, but not the sinews, are directly connected with the *artêriai*. This raises the question whether *pneuma* acts directly on the bones to set them in motion. This, too, is a matter in which he wants to underline his very different position (as he does in chapters 7 and 8).

Again in this chapter (as in 4, 482b22-5) it seems as if Aristotle's opponents have been unable to explain their view of the soul and its part in the process of respiration (5, 483b24-8). In 5, 483a28-9 he seems to suggest

that his opponents, like Plato, have failed to integrate the various 'parts' (functions) of the soul.

A recognizable link with chapter 4 can be noted in 5, 483a23. The author says here that the exhalation of breath can be empirically established. In 4, 482b19 he had said that this system of respiration is 'evident to a certain extent'. In chapter 5 the author observes once again that, according to his opponents, fish must also possess respiration to live. He rejects this utterly. The key word in the opening sentence of chapter 1, 'maintenance', is once again a striking feature here in 484a8.

Chapter 6

In the sixth chapter the author asks whether seed passes through the *artêriai* and he looks in detail at the relation between sinews and bones, and how they receive nutriment. Because his opponents posit a close link between the system of the *artêriai* with *pneuma* and the vascular system with blood, he points to the fact that birds, snakes, and fish have no blood at all.

Chapter 7

The author goes on to enumerate various functions of bones and then illustrates them systematically. They do form parts of members that can move, but motion is not the primary function of bones. For there are members which do move, but do not contain bones (the heart, the abdomen, and the intestines in it). He also formulates the thesis that all motion needs an unmoved starting-point.

Chapter 8

Keenly analyzing the final cause of things, the author concludes that the sinews bring about the motion of a living creature's members. So they must primarily contain the cause of motion, *pneuma*. The author illustrates this by speaking about the motion of bipeds, quadrupeds, birds, bats, and shellfish and crustaceans, from a fund of knowledge that immediately brings to mind *De incessu animalium*.

Chapter 9

In the final chapter the author administers the *coup de grâce* to his opponents. Since chapter 1 the subject has been the 'innate *pneuma*'. But his

opponents took this in the sense of the 'vital breath' of (higher) living creatures, and they added fish. The author has developed an entirely different interpretation. For him it is the 'innate vital heat', which is active not only in seed and in plants, but in all species of animals, from their very first beginning, under the direction of their form of life or soul. The opening sentence of chapter 9 characterizes the opponents as 'those who hold that it is not vital heat that is the efficient principle in bodies', and so characterizes the supporters of theories A and B from chapter 1 as those who assume a different 'efficient principle'. Though these opponents talk about a life-bearing *pneuma*, they see respiration as a more original and efficient principle.

Chapter 9 is an ode to the varied activity of this life-bearing and life-producing fire or vital heat. In this chapter the author underlines the close bond between the soul and its instrumental vital heat. And entirely in line with *De generatione animalium* and the (rest of the) *Parva naturalia* he describes how this one instrument of the soul brings forth a great variety of results in the whole of natural reality.

If *De spiritu* had received more attention and therefore been better understood, the fatal misinterpretation of Aristotle's psychology by Alexander of Aphrodisias, in which Aristotle regarded the soul as the entelechy of the visible body, could never have taken root.[49)]

7. What Positions Are Held by the Author of *De spiritu* Himself?

In the course of his critical inquiry into the two theories which he rejects, we do find several positions which the author of *De spiritu* himself holds.[50)]

- He is convinced that the concoction of food received by a living creature not only produces building materials for the parts of the visible body, but always residues (*perittômata*) as well—1, 481a19-20, b27-8.
- The respiration of living creatures is not characteristic of all living entities and not even of all animals, and therefore is not the central and most fundamental vital process, but serves to cool living creatures with high vital heat—2, 482a16; 3, 482a31, b1; 5, 483b6, 484a9-10.

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49) Cf. Bos 2003.

50) It would be useful to compare these with the description of "die pneumatische Theorie des Aristoteles" which W. Jaeger ([1913] 1960) gives on pp. 70-8. But that would take up too much room here.

– A related position is that insects (which have no respiration) do have a cooling system, but one which works via their diaphragm—2, 482a17.
– Water does not contain air (and so fish cannot possibly have a respiratory system)—2, 482a23.
– The pulsatory motion noticeable in many living creatures is not a phenomenon connected with respiration and the inhaled *pneuma*, but of the blood in the heart region—4, 482b36.
– All living creatures, including those which possess no respiratory system, have a principle of vital heat. That is why they need an opposite principle that provides the right balance in temperature—5, 484a7.
– Everything that is moved starts from a state of rest—7, 484b19. Tricot (1951, 189 n. 3) calls this a "principe fondamental de la Physique et même de la Métaphysique aristotéliciennes".
– Bones have a glutinous fluid surrounding them which can be regarded as blood that has not been fully concocted. They do not receive their nutriment via respiration or the *artêriai*—6, 484a32.
– In natural inquiry it is most useful to determine accurately what a thing's final cause is—8, 485a4-6.
– An interesting detail is that the author of *De spiritu* states in 8, 485a21 that shellfish do have feet, but not for the purpose of movement, but to support their weight, as *De incessu animalium* 19, 714a14 also argues.
– A fundamental starting-point in natural inquiry is: comparable effects have the same causes in the same way—2, 482a10-1, 24-5; 6, 484b7-8; 8, 485a11-2.

All these are positions that Aristotle developed and/or defended, like the very important position on 'the soul' held in *De spiritu*.

8. The Position of the Author of *De spiritu* on the Soul

While discussing the two theories which he reports in chapter 1, the author of *De spiritu* makes various remarks which build up an increasingly clear picture of his position on the soul.

– In 1, 481a16 he asks: can *pneuma* arise from nutriment if it is itself primary (*prôton*)? Because that which is connected with the soul is 'purer' (481a17), one would not expect it to arise from something like nutriment. This already sheds light on the view underlying the entire work

that *pneuma* is a *sôma* which is connected with the soul in a very special way and is the instrument of this soul. (For 'purer', cf. also 481a24.)

– In 2, 481b15-7 he opposes 'Aristogenes' when the latter states that breath derives its heat from the motion of the lungs. The author objects that in that case the vital breath is not 'the primary moving cause'. Clearly for the author *pneuma* does constitute 'the primary moving cause' (directed by the soul-principle).
– In 4, 483a3 the author distinguishes somatic disorders from fears, hopes, and tensions of the soul, which affect the frequency of the pulsatory motion of the blood in the heart. To anyone familiar with Aristotle's biological works, this passage makes it clear that in *De spiritu*, too, he posits a close relation between the soul and a *sôma*, which is, however, not the visible, coarse-material body, but the fine-material soul-*sôma* or *pneuma*, which forms an indissoluble unity with the soul. This soul-*sôma* is also the 'prime mover' of all vital activity, including the pulsatory motion.
– In 5, 483a23-7 the soul comes up in a discussion on perception. The author states that, according to his opponents, only the *artêria* possesses perception. He asks whether this is due to the inhaled air which flows through the *artêria*, or whether his opponents see the inhaled air as subordinate and serviceable to the soul, and so really regard the soul as the subject of perception. The starting-point of this question seems to be Aristotle's own theory of perception as a matter of the soul assisted by its instrumental *pneuma*.
– In 483a27-30 he raises the issue that, besides the nutritive activity of the soul, there is also the rational and the conative activity. The underlying question here seems to be: what guarantees the unity of the soul? This is a question which Aristotle often poses as a challenge to Plato.
– In 483b10 he talks about inhaled air in the view of his opponents as 'that which is the primary vehicle of the soul'. Again he uses his own terminology here and concludes that such a substance would have to be of the finest quality.
– In chapter 9 the author finishes off the opponents whose theory he contests throughout *De spiritu*. He states there that nature uses vital heat to produce living creatures (485b6-9). The soul is active in vital heat or *pneuma*. And it can be viewed as forming a unity with *pneuma* (485b13-5). It is the theory of the soul and its instrumental body which Aristotle

uses extensively in *De generatione animalium* 2.1, as in all his biological writings.[51)]

9. What Is the Position of 'Aristogenes' That the Author of *De spiritu* Contests?

If the author of *De spiritu* thinks and writes from the scientific perspective of Aristotle and nobody else, we must accurately determine which position he criticizes so persistently.

- This position awards a dominant place to respiration (and pays no or insufficient attention to life forms which do not have respiration).
- This view assigns a special place to inhaled air as the vehicle of all vital processes.
- The inhaled air also possesses vital heat as a result of the movement of this air in the lungs—2, 481b12-5.
- As a result of the respiratory process, blood is distributed via the veins and breath via the *artêriai* throughout the visible body of a living creature—5, 483a18-22, b25.
- Veins and *artêriai* are always situated side by side—5, 483b30-1. They are not two parts of one system, in the sense of blood vessels with oxygen-rich blood and blood vessels with oxygen-poor blood, but separate systems which need each other.
- The heat of the *pneuma* in the *artêriai* is responsible for the heat and the liquidity of the blood in the veins—5, 483b19-22.
- A living creature has perception because it possesses the vital *pneuma*, which is found in the *artêriai* throughout the visible body—5, 483a24-7.
- The alternating motion of respiration ensures that the vital *pneuma* is distributed through the *artêriai* and blood through the veins to the other parts of the visible body, for instance to the bones.
- Bones are set in motion through the effect of the vital *pneuma*.
- The process of respiration is a process that also brings about refrigeration of certain parts of the living creature—3, 482a31.

[51)] Claghorn 1954 contains an entire chapter (chapter 7) on 'Aristotle's Criticism of Soul', but not a single word about *De spiritu* and about what could be regarded as the most extensive criticism of Plato's *Timaeus*.

The relation of vital breath to the soul remains remarkably unclear in the discussion of the theory ascribed to 'Aristogenes'. In one place we are given the impression that he distinguishes three 'parts' of the soul, but does not indicate how their unity is to be seen (5, 483a28-30).

10. Who Are the Opponents in *De spiritu* and Who Is 'Aristogenes'?

The author of *De spiritu* thinks entirely in line with Aristotle's biological writings and his *De anima*. There is no position occupied by the author of *De spiritu* that cannot be explained with reference to parts of Aristotle's surviving and generally recognized work. The debate in *De spiritu* is also conducted with Empedocles and Democritus from the time before Aristotle, as in the *Parva naturalia*.

The author speaks here with the self-confidence of a teacher before an audience that recognizes him as such—2, 482a33; 6, 484a32. He also has the similar tendency to deal with subjects as a related whole, and therefore holds over a detailed discussion of the distribution of food to the parts of the body—3, 482b12-3—, just as Aristotle often does in his generally recognized writings. His criticism is mainly directed at the 'Aristogenes' mentioned in chapter 2, but also at supporters of 'Aristogenes', who seem to form a clearly identifiable group—2, 481b14, 18; 5, 483a27. Nothing in their views decisively indicates a late date. On the other hand, all the themes of *De spiritu* figure prominently in Plato's *Timaeus*.

– Plato describes the body of a living creature as being provided throughout with ducts by which food is conveyed (*Ti.* 77c7).
– This food, after being processed and dissected by the internal fire (78e6 τὸ πῦρ ἐντός), is transferred from the abdomen to the veins thanks to the process of respiration (78e5), and distributed through these veins (cf. 70d2; 80d).
– The respiratory system not only serves the purpose of nutrition, but also cools the heart (70c5).
– *De spiritu* 5, 483b34 attributes to 'Aristogenes' the view that fish breathe. This is also the position of Plato, *Timaeus* 92a7-b6.
– What Plato says in *Timaeus* 77d3 and 73b2, but particularly in 91a4, about the central importance of the marrow is a plausible explanation for the question in *De spiritu* 6, 484a14 whether semen is pressed

through the *artêria*, a question which at first sight seems to come out of the blue.
– In the *Timaeus* Plato also holds the view that the natural effect of fire is separation and cutting (cf. *Spir.* 9, 485a29).
– In the *Timaeus* Plato also awards sinews the function of holding bones together (75d4).

The writer seems to identify 'Aristogenes' with Plato. He may have permitted himself a literary joke here, with 'Aristogenes' as a sly allusion to Plato, whose father was in fact called Ariston.[52)]

11. Conclusions

Certainly *De spiritu* has places where the Greek text is corrupt.[53)] But these do not prevent us from following a large part of the author's argument and establishing that he is attacking two theories with which his own position is fundamentally at odds. These two theories place respiration at the heart of all vital processes. For Aristotle, respiration is not a primary process, not even for living creatures which possess such a system. Aristotle knows that all kinds of vegetative processes start in the seeds of a plant and the eggs of fishes and birds and the semen of blooded animals long before there can be any question of animal processes like respiration. Aristotle took pride in explaining the possibility and purposiveness of these processes by means of his theory of the soul as (first) entelechy in an indissoluble unity with its instrumental body, *pneuma* or vital heat.

Crucial to an understanding of the argument of *De spiritu* is the insight that this work talks about *artêriai* as 'vessels' which contain *pneuma*, but which also extend throughout the body and ensure concoction and distribution of the food. This was also essential to the theories of Empedocles

52) Cf. the way Heracles is referred to as 'Kadmogenes' in Sophocles, *Trachiniae* 118 and Xerxes as 'Dareiogenes' in Aeschylus, *Persians* 6 and 146. It might be objected that 'Aristono-genes' would have been expected. However, we do know quite a few people called 'Apollodorus', 'Apollophanes', 'Apollothemis', 'Artemidorus', and 'Isidorus', but not many called 'Apollonophanes', 'Apollonodorus', etc. Cf. Bechtel 1917.

53) We got invaluable support from Dr. D. Holwerda of the University of Groningen for the restoration of the text in several places.

and Plato disputed by Aristotle, as we can establish from Aristotle's own statements about these predecessors elsewhere in the Corpus.[54)]

If we read *De spiritu* as a preliminary 'shorthand' study by Aristotle, in the style of the *Problemata*, but also of many parts of the *Parva naturalia*, we find no compelling reason in the discussion to regard any part of it as post-Aristotelian. The author defends Aristotle's positions against Aristotle's opponents. It therefore seems justified to substitute 'Aristotle' for the designation 'Anonymus' in Jaeger's text edition.

Aristotle did not need to set out in detail the alternative doctrine of an innate *pneuma* (which is not identical with the inhaled air), given that this theory was familiar enough from his *Parva naturalia* and other biological works (and from the *Eudemus* and *De philosophia*, we might add). It is striking, though, that he does not give a detailed answer to the question with which the treatise opens: 'How is it that the innate *pneuma* maintains itself and grows?'

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54) Cf. Arist. *Resp.* 7, 473b1-474a6 on Empedocles, and *HA* 3.3, 664b6, where most scholars assume an allusion to Pl. *Ti.* 70c6-7.

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